

Appl. No. 10/783,495
 Amdt. dated 07/15/2008
 Response to Office action of 04/17/2008

Attorney Docket No.: N1085-00251
 [TSMC2003-0834]

REMARKS/ARGUMENTS

Claims 1-2 and 3-22 were previously pending in this application and each was rejected. No claim amendments are filed herein. Applicants respectfully request re-examination, reconsideration and allowance of each of pending claims 1 and 3-22.

5 I. **Claim Rejections - 35 U.S.C. § 102**

In paragraph 3 of the subject Office action, claims 1, 3, 4 and 9-11 were rejected under 35 U.S.C. § 102(b) as being anticipated by Park, U.S. Patent No. 6,825,912. Applicants respectfully submit that these claim rejections are overcome for reasons set forth below.

10 Claim 1 is the independent claim among the rejected claims and claim 1 recites the following features:

controlling the exposure energy with a feedback process
 control signal of critical dimension; and

15 and further controlling the exposure energy with a
 feed forward process control signal

Park does not teach controlling the exposure energy. Park is directed solely to adjusting photo-exposure time. In fact, the word "energy" does not appear in the Park patent reference. As an example, Park provides, in column 3, lines 25-27 "The photo-exposure unit can be made to adjust a photo-exposure time based on the
 20 adjustment signals received from the central processing unit." Only exposure time is discussed throughout the Park patent reference.

Because of the above-highlighted features and because Park does not provide any signal that controls the exposure ENERGY, claim 1 is distinguished from Park. Claims 3, 4 and 9-11 are similarly distinguished by virtue of their dependencies and
 25 therefore the rejection of claims 1, 3, 4 and 9-11 as being anticipated by Park, should be withdrawn.

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II. Claim Rejections – 35 U.S.C. § 103 – Claims 5-8, 12-15, 17, 20 and 22

In paragraph 11 of the subject Office action, claims 5-8, 12-15, 17, 20 and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park in view of U.S. Patent No. 6,798,529 to Saka, et al. (hereinafter "Saka"). Applicants respectfully submit that these claim rejections are overcome for reasons set forth below.

Claims 5-8 depend from claim 1, which is distinguished from Park, as above. Saka has apparently been relied upon for an interlayer thickness measurement after chemical mechanical planarization. This does not make up for the above-stated deficiencies of Park. Saka, is not directed to controlling exposure energy. Saka, in fact, is not even directed to controlling the exposure process in any manner. Saka is directed to detecting endpoint in chemical mechanical polishing (CMP). In Saka, the control signals based on thickness measurements are only used to control the CMP apparatus. For example, Saka, at column 5, lines 58-60, provides: *a method and apparatus which monitors reflectance at various surface areas of the wafer and controls the polishing process.*

Because Saka does not make up for the above-stated deficiencies of Park, independent claim 1 and therefore also dependent claims 5-8, are distinguished from Park in view of Saka. The rejection of claims 5-8 under 35 U.S.C. § 103(a) as being unpatentable over Park in view of Saka, should be withdrawn.

Claim 12 represents a further independent claim. Claim 12 recites the features of:

a feed forward controller providing a feed forward control signal to an exposure apparatus based on a thickness measurement of an interlayer of the first patterned wafer substrate for controlling the exposure energy focused on a top layer of the first patterned wafer substrate, and

a feedback controller providing a feedback exposure energy control signal to the exposure apparatus based on critical dimension measurement of a top layer of a second patterned

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wafer substrate of a previous manufacturing lot, the critical dimension being one of a width, a spacing and an opening of the second patterned wafer substrate,

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wherein a combiner combines the feed forward control signal and the feedback exposure energy control signal to produce a combined signal that is provided to the exposure apparatus.

Independent claim 12 therefore also recites the features of a feed forward control signal to an exposure apparatus for controlling the exposure energy and also a
10 feedback exposure energy control signal to the exposure apparatus. Claim 12 is therefore distinguished from the combination of Park and Saka, neither of which provide any exposure energy control signal whatsoever. Claim 12 is therefore distinguished from Park in view of Saka.

Claims 13-15, 17, 20 and 22 are similarly distinguished by virtue of their
15 respective dependencies and therefore the rejection of claims 5-8, 12-15, 17, 20 and 22 should be withdrawn.

III. Claim Rejections – 35 U.S.C. § 103 – Claims 16, 18, 19 and 21

In paragraph 23 of the subject Office action, claims 16, 18, 19 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park in view of Saka and
20 further in view of U.S. Patent No. 6,630,362 to Lensing, hereinafter "Lensing". Applicants respectfully submit that these claim rejections are overcome for reasons set forth below.

Claims 16, 18, 19 and 21 each depend, directly or indirectly, from independent claim 12, which is distinguished from Park in view of Saka for reasons set forth above.
25 Claims 16, 18, 19 and 21 are therefore also distinguished from the combination of Park and Saka.

Lensing has apparently been relied upon for providing "a thickness measurement device" and for "providing thickness measurement of a patterned wafer substrate

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(col. 7, lines 23-27)", subject Office action, p. 13, first paragraph. The Office action further states, in paragraph 2 of page 13, that it would have been obvious "to modify the teaching of Park in view of Saka to include a *thickness measurement device providing thickness measurement* of a patterned wafer substrate *to detect variations and adjust the stepper (i.e., exposure)* to correct nonconformity. (col. 6, lines 56-59 and col. 7, lines 1-5)." [emphasis added].

Applicants submit, however, that Lensing does not utilize thickness measurements by providing thickness measurements to adjust a stepper (i.e., exposure) as suggested by the Examiner and Lensing therefore does not provide "a feed forward controller providing a feed forward control signal to an exposure apparatus based on a thickness measurement" as recited in claim 12. Lensing, rather, utilizes thickness measurements to adjust the polishing process. Col. 7, ll. 23-32 provide:

Scatterometry measurements can also be made on shallow trench isolation (STI) structures. The thickness of silicon dioxide, using tetraethoxysilane (TEOS), used to fill STI structures 240 can be measured using the scatterometry techniques . . . The results from the scatterometry error analysis unit 170 can be used to adjust polishing processes of TEOS layers and fillings in STI structures.

As such, the thickness measurements in Lensing are used to adjust polishing processes, not an exposure apparatus, such as the feature recited in claim 12. Claim 12 is therefore distinguished from Lensing in combination with Saka and Park. Furthermore, Lensing cannot and does not provide a combiner that combines the claimed feed forward signal (based on thickness measurement) and a feedback exposure energy control signal to produce a combined signal that is provided to the exposure apparatus, such as further recited in claim 12.

Lensing therefore does not make up for the above-stated deficiencies of the combination of Park and Saka. Claim 12 is therefore distinguished from Park in view of Saka and Lensing.

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For at least these reasons, the rejection of claims 16, 18, 19 and 21 under 35 U.S.C. § 103(a) as being unpatentable over Park in view of Saka and further in view of Lensing, should be withdrawn.

CONCLUSION

5 Based on the foregoing, each of pending claims 1 and 3-22 is in allowable form and the application in condition for allowance, which action is respectfully and expeditiously requested.

10 The Assistant Commissioner for Patents is hereby authorized to charge any fees necessary to give effect to this filing and to credit any excess payment that may be associated with this communication, to Deposit Account 04-1679.

Respectfully submitted,

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